

# REPORT DOCUMENTATION PAGE

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AFRL/PRS  
5 Pollux Drive  
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Air Force Research Laboratory (AFMC)  
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Approved for public release; distribution unlimited.

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14. ABSTRACT

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19a. NAME OF RESPONSIBLE  
PERSON

Leilani Richardson

a. REPORT

b. ABSTRACT

c. THIS PAGE

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19b. TELEPHONE NUMBER  
(include area code)  
(661) 275-5015

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62

separate items are enclosed

C8

MEMORANDUM FOR PRS (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO)

20 September 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2000-179**  
Drake, Greg; Tollison, Kerri (ERC), et al., "The Synthesis and Characterization of New Energetic Salts"

**HEDM Conference (Park City, UT, 24-26 Oct 2000)**  
**(Deadline: 25 Sep 2000)**

**(Statement A)**

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review

Comments: \_\_\_\_\_  
\_\_\_\_\_  
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Signature \_\_\_\_\_ Date \_\_\_\_\_

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b.) appropriateness of distribution statement, c.) military/national critical technology, d.) economic sensitivity, e.) parallel review completed if required, and f.) format and completion of meeting clearance form if required

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

4. This request has been reviewed by PRS for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

APPROVED/APPROVED AS AMENDED/DISAPPROVED

\_\_\_\_\_  
PHILIP A. KESSEL Date  
Technical Advisor  
Propulsion Science and Advanced Concepts Division

## The Synthesis and Characterization of New Energetic Salts

Greg Drake; Kerri Tollison\*; Tom Hawkins; Adam Brand; Milton McKay; Ismail Ismail\*

AFRL/PRSP & \*ERC, Inc., 10 East Saturn Boulevard, Bldg 8451  
Air Force Research Laboratory, Edwards Air Force Base CA 93524-7190

As growing concerns arise over the use of hydrazine in monopropellant systems, alternatives to replace it are being sought by several investigators in the field. At AFRL, we have been pursuing the use of energetic salts as viable monopropellant ingredients. They have several inherent advantages over hydrazine, which include, essentially no vapor pressure, which results in low vapor toxicities, significantly higher densities, and overall, significantly higher performing materials. Recently, we have been investigating several salt systems based on amino substituted triazole systems. Most of the heterocycle systems which were investigated are either commercially available or are synthesized in simple, high-yield operations. The triazole systems investigated include 1H-1, 2, 4-triazole, 4-amino-1, 2, 4-triazole, 3, 4, 5-triamino-1, 2, 4-triazole, 3-hydrazino-4-amino-1, 2, 4-triazole, and 1H-1, 2, 3-triazole. The nitrate, perchlorate, and dinitramide salts were synthesized and characterized by vibrational and multinuclear nmr spectroscopy, and elemental analyses. Other materials will also be discussed, including the synthesis and characterization of energetic salts of ethylene bisoxamine,  $\text{NH}_2\text{-O-CH}_2\text{-CH}_2\text{-O-NH}_2$ , and 1, 3-diamino-2-propanol,  $\text{NH}_2\text{-CH}_2\text{-CH(OH)-CH}_2\text{-NH}_2$ . Both of these systems were used to make a large family of energetic salts. In all cases, the thermal stability and safety properties, including impact and friction testing, were carried out on these new salts, and the results will be presented.

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### **DISTRIBUTION STATEMENT A**

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